

Public Workshop to Discuss Proposed Amendments to the Regulations for Ocean-going Ship Main Engines, Auxiliary Engines and Auxiliary Boilers



February 17, 2011
Sacramento, CA

California Environmental Protection Agency



Air Resources Board

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Overview

- ♦ **Background**
- ♦ **Recap of October 2010 Workshop-Proposed Amended Regulatory Zone**
- ♦ **Air Quality and Health Impacts**
- ♦ **Air Quality Modeling**
- ♦ **Other Proposed Amendments**
- ♦ **Next Steps**
- ♦ **Contacts**



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Background

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California's Ocean-Going Vessel Clean Fuel Regulation

- ♦ Adopted by ARB in July 2008
- ♦ Implementation began July 2009
- ♦ Provides immediate and significant emissions reductions
 - Diesel PM: 83% reduction
 - SOx: 96% reduction
 - NOx: 6% reduction
- ♦ Establishes “bridge” to ECA in the 2015 timeframe

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Requirements-California's Ocean-Going Vessel Clean Fuel Regulation

- ♦ Requires use of cleaner fuels in main engines, auxiliary engines and auxiliary boilers
- ♦ Two-phase implementation
 - July 1, 2009
 - use marine gas oil (averages 0.26% sulfur), or
 - use marine diesel oil with a 0.5% sulfur limit
 - January 1, 2012
 - use marine gas oil with a 0.1% sulfur limit, or
 - use marine diesel oil with a 0.1% sulfur limit

*ARB 2012 fuel sulfur limit is the same as the 2015 North American ECA fuel sulfur limit (0.1%)

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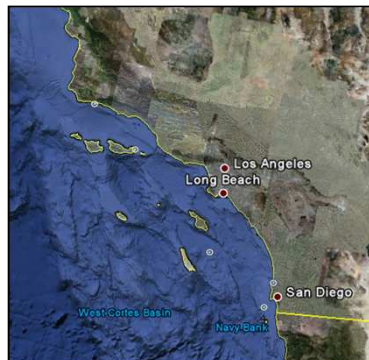
Requirements-California's Ocean-Going Vessel Clean Fuel Regulation

- ♦ Applies to US and foreign-flagged ocean-going vessels
- ♦ Requires use of cleaner fuels within 24 nautical mile zone of the California coastline



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Recap of October 2010 Workshop- Proposed Amended Regulatory Zone



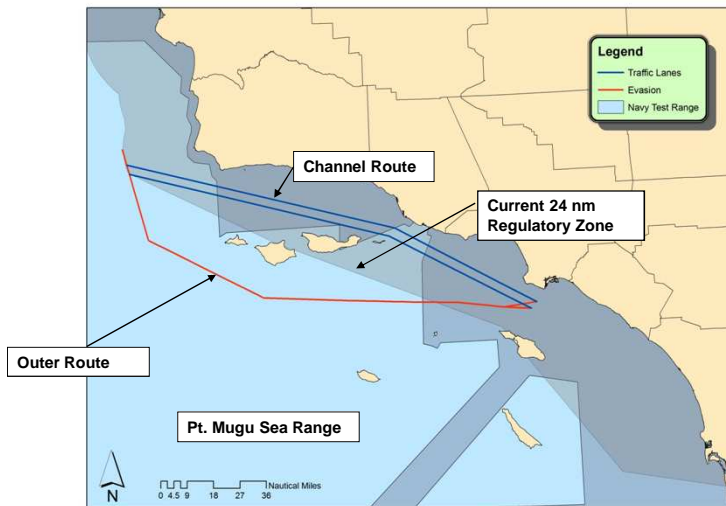
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Changes in Vessel Traffic Patterns Impact Expected Emission Reductions

- ♦ **Many vessel operators choosing to not transit through the established shipping lanes in Santa Barbara Channel**
 - results in increased vessel traffic south of the Channel Islands (about 50% of POLA/POLB visits)
- ♦ **Changes in traffic pattern driven by fuel cost differential**
- ♦ **Changes in vessel routing are reducing anticipated emissions reductions**
- ♦ **Changes in vessel routing are increasing vessel traffic through the Pt. Mugu Sea Range**

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**Current Rule Status-
Vessels are Changing Routes from the Established
Santa Barbara Channel Shipping Lanes and Using a
Route Outside the Channel Islands**



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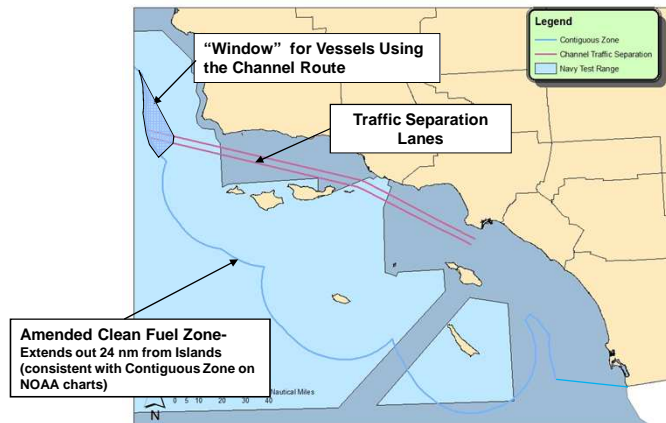
**Proposed Amendments Necessary to
Address Impacts of Route Changes**

- ♦ Recapture lost emission reductions due to vessel route changes
- ♦ Reduce vessel traffic through the Pt. Mugu Sea Range



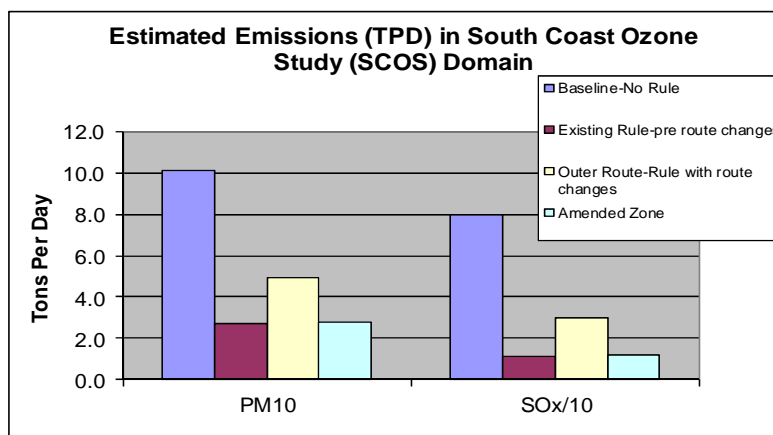
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Proposed Amended Clean Fuel Zone



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Proposed Amended Clean Fuel Zone Recaptures Emissions Reductions



*Year 2010, 50% of POLA/POLB vessel visits using outer route

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Proposed Amendments to Regulatory Zone Consider Impacts on Emissions and Sea Range

- ♦ **Contiguous Zone is a recognized nautical zone and is depicted on NOAA maritime charts**
- ♦ **Proposed amended clean fuel zone restores emission reduction levels anticipated with original rule and historic vessel routing**
- ♦ **Eliminate economic advantage of transiting through the Point Mugu Sea Range**

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Air Quality and Health Impacts

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Air Quality Modeling Used to Evaluate Air Quality and Health Impacts

- ♦ Evaluated three scenarios
 - existing rule (pre-rule traffic patterns, 24 nm regulatory zone)
 - outer route (change in vessel traffic pattern: current situation with 50% of vessels using outer route, 24 nm regulatory zone)
 - proposed amended regulatory zone (extending zone out 24 nm past Channel islands)
- ♦ Evaluated health impacts
 - premature mortality avoided (annual cardiopulmonary mortality from PM_{2.5})
- ♦ Evaluated air quality impacts

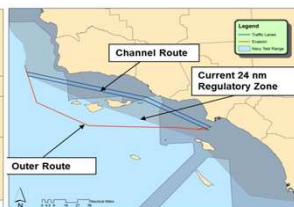
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Evaluated Three Scenarios for Air Quality and Health Impacts

Existing Rule Scenario



Outer Route Scenario

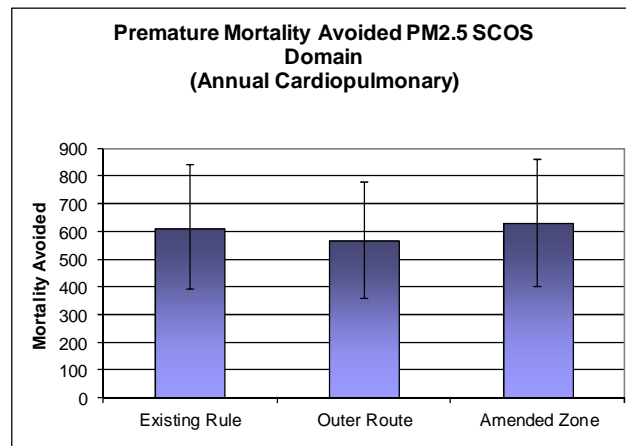


Proposed Amended Zone Scenario



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Proposed Amended Zone Restores Anticipated Health Benefits-Premature Mortality Avoided, SCOS Domain



Annual Cardiopulmonary Mortality in SCOS Domain due to PM2.5. Outer Route reflects 50% of POLA/POLB vessel visits using outer route. 2005 base year for all scenarios.

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Air Quality and Health Impacts From Amending the Regulatory Zone

- ♦ Proposed amended zone achieves air quality and public health benefits originally anticipated with rule
 - similar onshore PM2.5 concentrations
 - similar onshore ozone concentrations
 - restores health benefits and emissions reductions

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Overview of Air Quality Modeling

Vernon Hughes,
Manager, Atmospheric
Modeling & Support
Section

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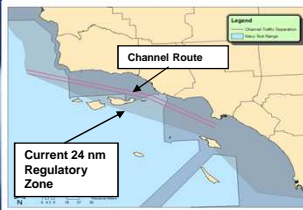
Air Quality Modeling Used to Evaluate Air Quality and Health Impacts

- ♦ **Air Quality Modeling (CMAQ-Community Multiscale Air Quality model)**
 - evaluated three scenarios
 - existing rule (pre-rule traffic patterns, 24 nm regulatory zone)
 - outer route (change in vessel traffic pattern: current situation with 50% of vessels using outer route, 24 nm regulatory zone)
 - proposed amended regulatory zone (extending zone out 24 nm past Channel islands)
 - compared scenario to pre-rule baseline
- ♦ **Evaluation of Air Quality include:**
 - PM2.5: percent difference in concentration
 - ozone: percent difference in concentration

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Evaluated Three Scenarios for Air Quality and Health Impacts

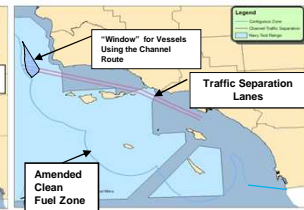
Existing Rule Scenario



Outer Route Scenario



Proposed Amended Zone Scenario



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Air Quality and Health Impacts

Existing Rule Scenario



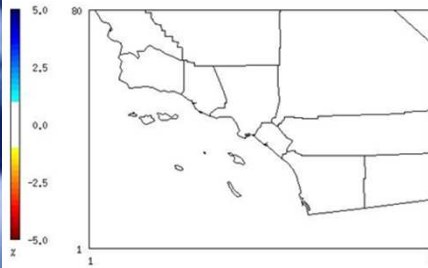
Impacts from the Existing Rule*

*Assumes pre-July 2009 vessel traffic pattern with majority of vessels, except laden tankers, using channel route

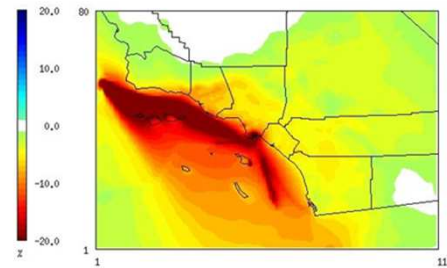
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Rule Provides Significant Reductions in Onshore PM2.5 Concentrations* in SCOS Domain (Existing Rule Compared to Baseline)

Annual Maximum 8-hour O₃ Concentrations



Annual Average PM2.5 Concentrations



*Negative value indicates a decrease in concentration compared to the baseline.
Positive value indicates an increase in concentration compared to the baseline.

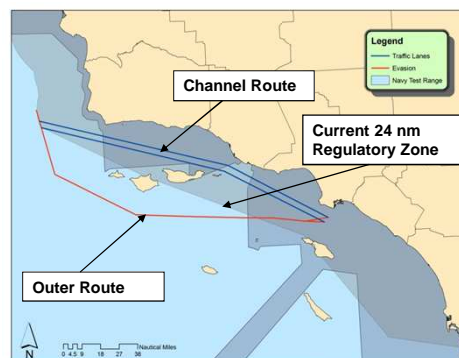
Percentage difference in model-simulated, annual maximum 8-hour O₃ concentrations (left) and annual-average PM2.5 concentrations (right) due to Rule Scenario versus Baseline Scenario. Only changes >1% and <-1% are shown in the plots. Rule with 24 nm clean 0.1% S fuel zone, ships using channel route, 2005 base year

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Air Quality and Health Impacts

Outer Route Scenario

Impacts from Changes in Vessel Routes*

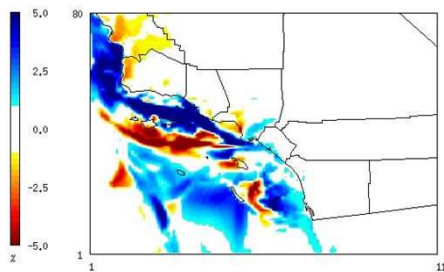


*50% of Port LA/LB vessel visits using outer route

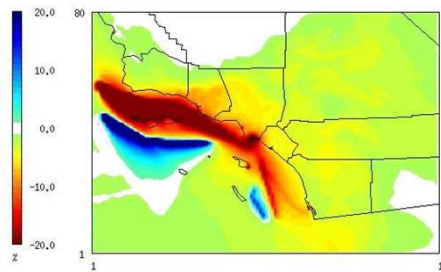
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Change in Traffic Pattern Impacts Onshore PM2.5 and Ozone Concentrations* (Outer Route Compared to Baseline)

Annual Maximum 8-hour O₃ Concentrations



Annual Average PM2.5 Concentrations



*Negative value indicates a decrease in concentration with the outer route scenario compared to the baseline. Positive value indicates an increase in concentration with the outer route scenario compared to the baseline.

Percentage difference in model-simulated, annual maximum 8-hour O₃ concentrations (left) and annual-average PM2.5 concentrations (right) due to Outer Route Scenario versus Baseline Scenario. Only changes >1% and <-1% are shown in the plot. Outer Route Scenario with 24 nm clean fuel zone, 2005 base year, 50% POLA/LB vessel visits using outer route

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Air Quality and Health Impacts

Impacts of Amending the Regulatory Zone*

Proposed Amended Zone Scenario

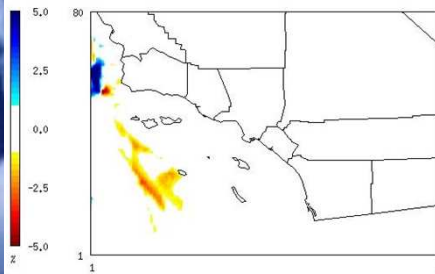


*Assumes pre-July 2009 vessel traffic pattern with majority of vessels, except laden tankers, using channel route

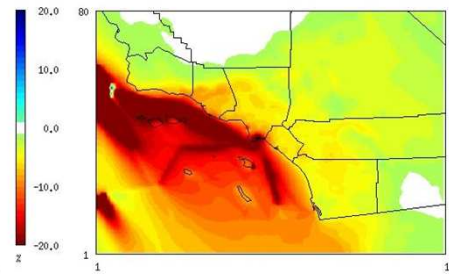
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Amended Zone Maintains Anticipated Onshore Air Quality Benefits* (Amended Zone Compared to Baseline)

Annual Maximum 8-hour O₃ Concentrations



Annual Average PM_{2.5} Concentrations

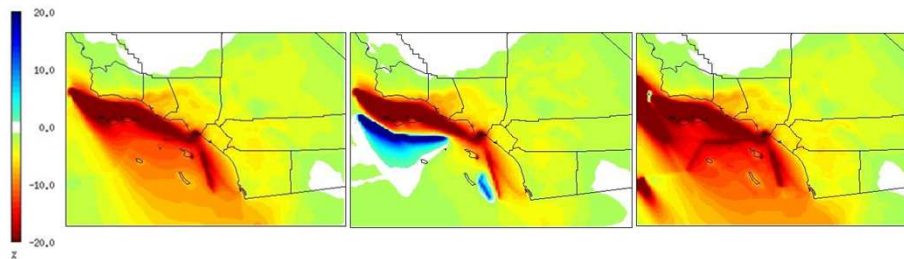


*Negative value indicates a decrease in concentration with the amended zone scenario compared to the baseline. Positive value indicates an increase in concentration with the amended zone scenario compared to the baseline.

Percentage difference in model-simulated, annual maximum 8-hour O₃ concentrations (left) and annual-average PM_{2.5} concentrations (right) due to Amended Zone with Window versus Baseline. Only changes >1% and <-1% are shown in the plot. Vessels using channel route, 2005 base year for amended zone and baseline scenarios

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Percent Change in Annual Average PM_{2.5} Concentrations



Existing Rule vs. Baseline

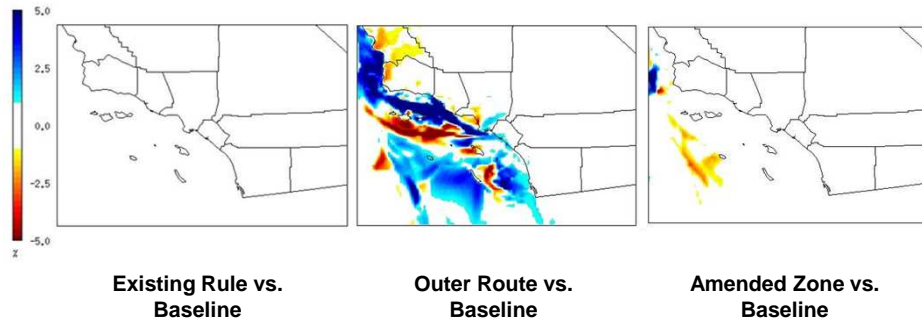
Outer Route vs. Baseline

Amended Zone vs. Baseline

*Negative value indicates a decrease in concentration compared to the baseline. Positive value indicates an increase in concentration compared to the baseline.

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Percent Change in Annual Maximum 8-hour O₃ Concentration



*Negative value indicates a decrease in concentration compared to the baseline.
Positive value indicates an increase in concentration compared to the baseline.

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Air Quality and Health Impacts From Amending the Regulatory Zone

- ♦ **Proposed amended zone restores air quality benefits originally anticipated with rule**
 - similar onshore PM_{2.5} concentrations
 - similar onshore ozone concentrations

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Other Proposed Amendments



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Other Proposed Amendments

- ♦ ISO 8178 Fuel Standard
- ♦ Modify Noncompliance Fee provisions



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ISO 8178 Fuel Standard

- ♦ **Propose to allow either the 2005 or 2010 versions of ISO 8178 fuel standard**
 - **2005 version still widely used as industry standard**
 - **2010 versions includes**
 - **higher viscosity DMZ grade**
 - **lubricity specifications for DMA, DMB and DMZ**

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Proposed Noncompliance Fee Amendments

- ♦ **Fee reduction for vessels that can bunker compliant fuel on arrival in California**
- ♦ **Excluding an offshore anchorage as a separate port visit in assessing fees**
- ♦ **Proposed fee structure adjustments**

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Proposed Fee Structure Adjustments

Proposed Amendment to the Noncompliance Fee Schedule, Per Vessel

Table 1: Noncompliance Fee Schedule, Per Vessel

Port Visit	Per-Port Visit Fee
1 st Port Visited	\$45,500
2 nd Port Visited	\$45,500 \$91,000
3 rd Port Visited	\$91,000 \$136,500
4 th Port Visited	\$136,500 \$182,000
5 th or more Port Visited	\$182,000 \$227,500

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Discussion Point

Should ARB Phase 2 Implementation Date be Adjusted to More Closely Coincide with ECA Phase 2?

♦ Move Phase 2 start date to Jan. 1, 2014

Fuel Requirements

ARB Phase 1 July 1, 2009	Distillate fuel MGO max 1.5% S MDO max 0.5% S (Average=0.26% S)
ARB Phase 2 Jan 1, 2012 ARB Phase 2 Jan 1, 2014	Distillate fuel: MGO max 0.1% MDO max 0.1%

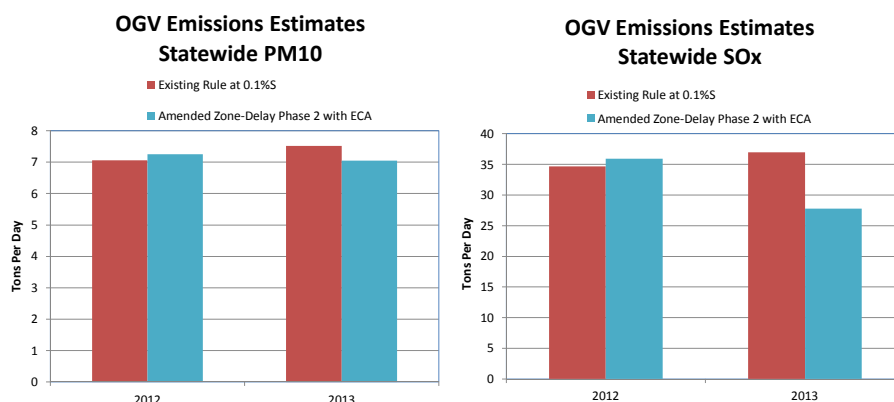
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Advantages to Delaying Phase 2

- ♦ **Facilitates continued high compliance rate and successful transition to 0.1%S low sulfur fuels**
 - Provides industry with additional time between implementing ECA Phase 1 (1% S to ~200 nm) and ARB's Phase 2 (0.1%S)
 - Lessens any near term, port specific availability issues with 0.1% S fuel
 - Provides shippers more flexibility in purchasing higher viscosity compliant distillate
- ♦ **ECA, amended zone and low average Phase 1 fuel sulfur content (0.26 %S) help to offset small loss in projected emissions reductions**
- ♦ **Continues to meet 2014 SIP commitment**

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ECA, Amended Zone and Low Average Phase 1 Fuel Sulfur Content (0.26 %S) Help to Offset Small Loss in Projected Emissions Reductions



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Summary

- ♦ **Changes in vessel traffic patterns impacting anticipated emission reductions, onshore air quality and public health**
- ♦ **Proposed amendments will:**
 - restore anticipated emissions reductions and fulfill SIP commitment
 - eliminate economic incentive to go through the Sea Range
 - update specifications
 - add flexibility to the Noncompliance Fee provision

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Next Steps

- ♦ **Complete cost analysis**
 - Preliminary estimates indicate small incremental increase compared to costs presented in 2008 Staff Report
 - Cost effectiveness will be very similar to original estimates
- ♦ **Release Staff Report: April 2011**
- ♦ **ARB Board Date: May, 2011**



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Contact Information

**Bonnie Soriano
(Lead Staff)**

(916) 327-6888

bsoriano@arb.ca.gov

**Peggy Taricco
(Manager)**

(916) 323-4882

ptaricco@arb.ca.gov

**Paul Milkey
(Staff)**

(916) 327-2957

pmilkey@arb.ca.gov

**Dan Donohoue
(Branch Chief)**

(916) 322-6023

ddonohou@arb.ca.gov

<http://www.arb.ca.gov/marine>

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